RFC 191
NIC 7136
Category D.6, I.1

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13-JUL-71

GRAPHICS IMPLEMENTATION AND CONCEPTUALIZATION AT ARC

Overview:

This document is a brief description of the way in which graphics terminals are conceptualized and used at the Augmentation Research Center. All things described are implemented and have been operational for several months. Although our attention has initially been centered about the display of textual material, we are now about to turn our attention toward pictoral displays (hopefully much enhanced over our previous 940 line drawing capabilities).

This document will discuss only those facits of display use which have been implemented and are currently operational, namely only those dealing with textual display.

included is a discussion of the use of multiple file viewing display areas in NLS to provide cross file editing capabilities. A description of our display and terminal input equiptment will be issued as a separate document.

NOTE: RFC 190 includes a functional description of the implementation of the interface to our displays and is a description of the way this interface was extended to include "Processor-displays" (an IMLAC PDS-1, in this case) to our system, thus enabling one to use Display NLS over any of our teletype lines (including the network).

A "processor dsplay" is a display with processing power which can be controled by character strings.

Description of the "conceptual display" implemented at ARC

The allocatable output unit for our display terminals (which include our local terminals and all remote processor-displays) is a rectangular "display area". A program treats this display area much like it would a file which it has opened with write access.

When requesting the allocation of a display area, a program specifies its attributes, including where it is to be on the screen. The program is returned an identifier which it subsequently uses to manipulate images within the display area and the display area itself. Each string which the program writes into the display area is also given an identifier, which can subsequently be used to move, delete, replace, or change the characteristics of that string.

The currently implemented characteristics are character size, horizontal spacing between characters, and font of the characters (e.g. blinking, italics, intensity, etc.).

The position of items in the display area are given relative to the 0,0, which is the lower left corner of the display area. The horizontal cordinate increases to the right and the vertical coordinate increases toward the top.

In addition to above described manipulation of strings within display areas, a program can suppress the display of individual strings whithin display areas or suppress whole display areas.

Also, a program can switch the terminal's state from teletype simulation to display mode and vis versa.

When in display mode, the teletype simulation display area is suppressed and the coordinates of the cursor are input with each character. When in teletype simulation mode, all user owned display areas are suppressed and the coordinates of the cursor are not input with each character.

At TENEX startup time, display areas are allocated for a teletype simulation and a cursor for each local display terminal. Programs can change the string being displayed as the cursor to give the human feedback as to the programs state.

Within NLS:

The NLS subsystem deals only with the cursor and the display areas it has requested from the systemfor output to the user. The display area formatters assumes that the display has 64K by 64K addressable points (with 0,0 at upper left), several different character sizes and fonts, and 7-bit ASCII.

The display area formatters use format parameters during the format process and post-processors to convert the vertual format to one that is acceptable to the device for which the formatting was being done (a display area on the screen, a page for a printer, a microfilm device, or a teletype).

NLS allows the user to specify arguments to commands by selecting items from the current display image. This is accomplished through the use of a data structure, which describes the current display image, to map the cursor cordinates, which are input with each character, into the proper selection.

Multiple text display areas in NLS

When the user's device is a display, NLS allows him to subdivide the file-viewing display area (the one in which he views his file) and view (and edit across) several different files at once. Following is a discussion of the commands and capabilities associated with this new feature.

new commands

Horizontal split

splits a file-viewing display area horizontally (into an upper and lower segment) at the selected location moving the image of the original display area to the upper or lower segment depending on whether the cusor is above or below the bugged position when the final Command Accept is input.

No display area will be created which is smaller then 2 lines by 20 columns (using the character size of the original display area).

Vertical split

splits a file-viewing display area vertically (into a left and right segment) at the selected location moving the image of the original display area to the left or right segment depending on whether the cursor is to the left or right of the selected position when the final CA is input.

No display area will be created which is smaller then 2 lines by 20 columns (using the character size of the original display area).

Move boundary

The selected boundary is moved to the new position. A boundary will not be moved passed a boundary of a neighbor. A boundary is moved for all display areas for which it is a boundary. Any resulting display area which is smaller than two lines by twenty columns will be deleted.

Character size

The current character size of the display area which currently contains the cursor is displayed, and the user may type a number (0, 1, 2, 3) for a new character size. The final Command Accept causes the character size to be changed. The horizontal and vertical increment are automatically adjusted. Different display areas may simultaneously have different character sizes.

Clear display area

The selected display area is cleared, i.e. the image is erased, the return and file return rings are released, and the association of a file with that display area is removed. The display area itself is not deleted.

One may freely edit and jump using several display areas. The position of the cursor is used to resolve ambiguities.

For example, If one executes a Jump command, the position of the cursor when the final Command Accept is entered determines in which display area the new image is to appear.

Also, If one changes viewspecs using the leftmost two buttons of the mouse, the viewspecs of the display area containing the cursor when the buttons go down are used as the initial values and are displayed in the viewspec area. When the buttons are released, the display area containing the cursor receives the new viewspecs.